

# Integration of RGB “Dust” Imagery to Operations at the Albuquerque Forecast Office

Kevin Fuell<sup>1</sup>, Brian Guyer<sup>2</sup>

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<sup>1</sup>NASA-SPoRT / University of Alabama Huntsville

<sup>2</sup>NOAA National Weather Service – Albuquerque Forecast Office



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# Forecast Issue and Hypothesis

## Detection and Analysis of Blowing Dust for Aviation

- Impact to ceiling and visibility
- Difficult to detect when clouds present/mixed
- Dust color similar to dry land surface in True Color

Hypothesis: EUMETSAT Dust RGB via MODIS/VIIRS increases aviation forecast lead times via greater efficiency in analysis

## Prior Method of Dust Analysis at ABQ

- GOES visible (some IR)
- MODIS/VIIRS True Color
- ASOS often initial indicator
- Social media
- DOT reports from travelers
- NEW: Dual Pol radar



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# Dust RGB Components

Color	Band / Band Diff.	Physically Relates to....	Little contribution to composite indicates.....	Large contribution to composite indicates .....
Red	12.0 – 10.8	Optical thickness	Thin clouds. Difference is negative. <i>Less of the 12um channel passes through the clouds (colder brightness temperature) than the 10.8um channel</i>	Thick clouds or dust. Difference is positive. <i>More of the 12um channel passes through the clouds (Warmer brightness temperature) than the 10.8um channel</i>
Green	10.8 – 8.7	Particle phase (ice vs water) or composition	Ice particles or particles of similar characteristics have small difference	High clouds over desert regions – emission from surface overwhelms the relationship
Blue	10.8	Temperature of surface	Cold surface	Warm surface

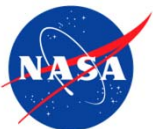
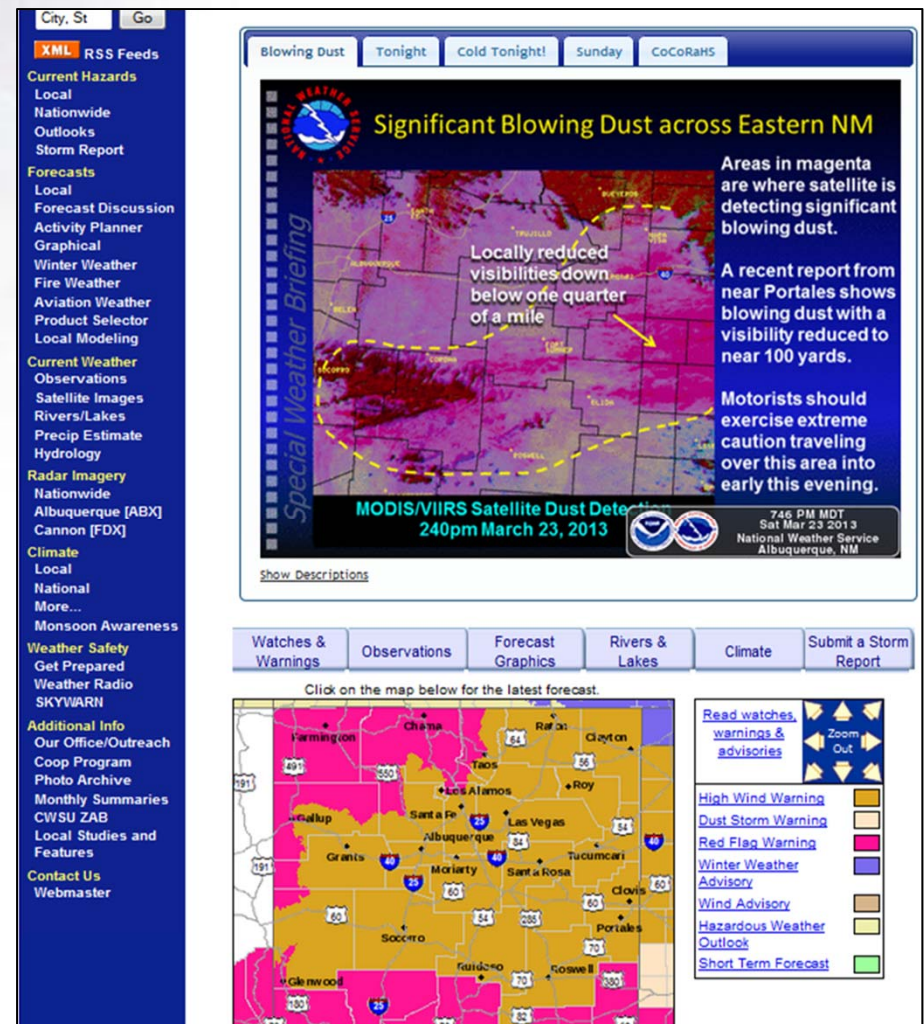


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# Plan for Integration of Dust RGB

- Forecaster intro. of RGB via teletraining, WES case
- Quick Guide for use in operations area
- Demonstrate RGB as complement to other products
- Assess product in small testbed (Front Range group) to understand operational value and limitations

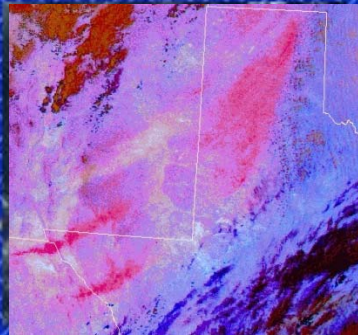


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# Getting “Buy-In” from Users



Recipe for: **RGB Success at ABQ**  
By Great Auntie Kann

1. A coherent support team
  - a) 1 cup IT skill, 1 cup collaboration, 2 cups willingness
  - b) Add product to user display and monitor in real-time
2. “Buy in” from the local staff or users
  - a) Add advocate and blend w/ examples (peer-to-peer)
3. Support from SPoRT
  - a) Serve product with other user favorites
  - b) Add training & visits until smooth consistency

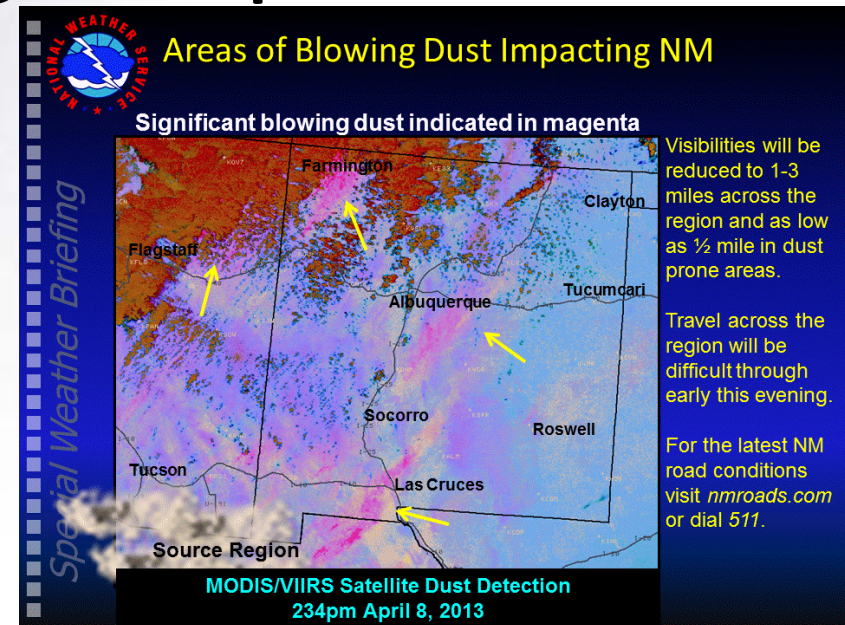


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# How has it Changed Operations?

- Highest impact is to Aviation forecast updates to ceiling/vis.
  - More clearly detect vs. Vis.
  - More confidence regarding coverage vs. point obs.
  - Nighttime detection
- Details in “Aviation” portion of Forecast Discussion
- Public forecast grids updated to narrow areas impacted
- Future: Support for “Dust Advisories”
- Traditional NWP methods compared to patterns seen in RGB



- RGB integrated into Graphicast (above) and other social media. ABQ: “Power users eager for this information”. (i.e. Improves communication method to the public)



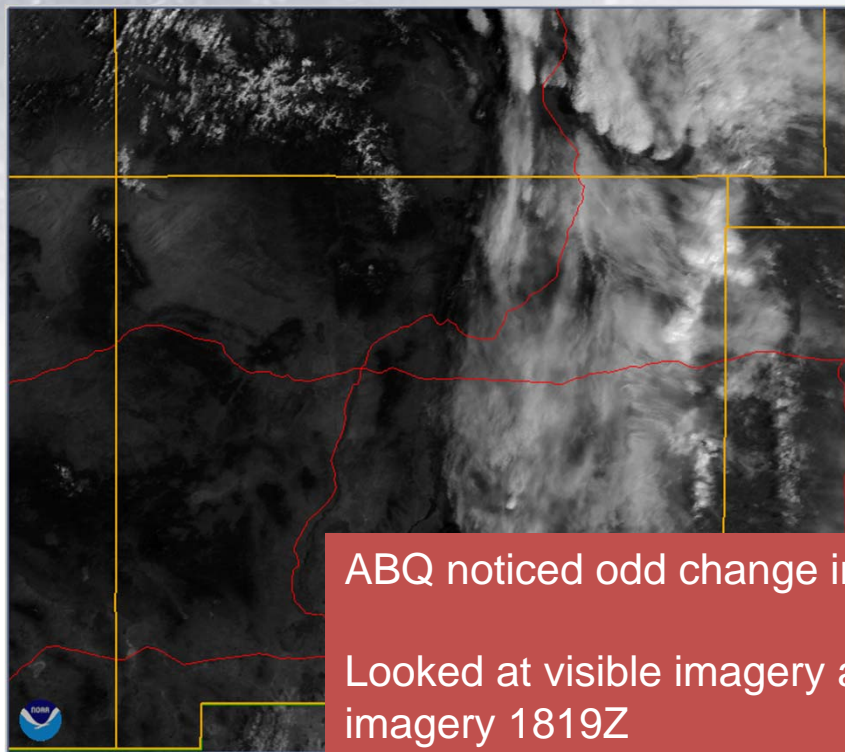
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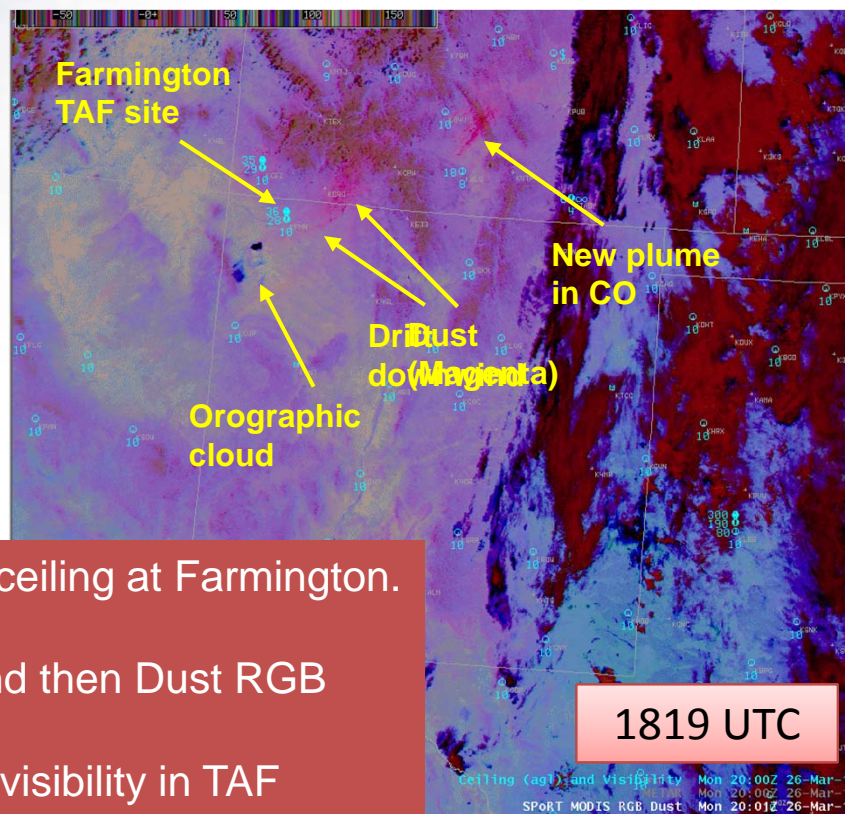


# Mesoscale Example

26-Mar-2012 GOES Vis. 1700-2200 UTC



26-Mar-2012 MODIS Dust RGB



ABQ noticed odd change in ceiling at Farmington.

Looked at visible imagery and then Dust RGB imagery 1819Z

- Modified forecast ceiling & visibility in TAF

RGB provided extent and source

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# Daytime Example

21-Mar-2013 GOES Vis. 1830-2200 UTC

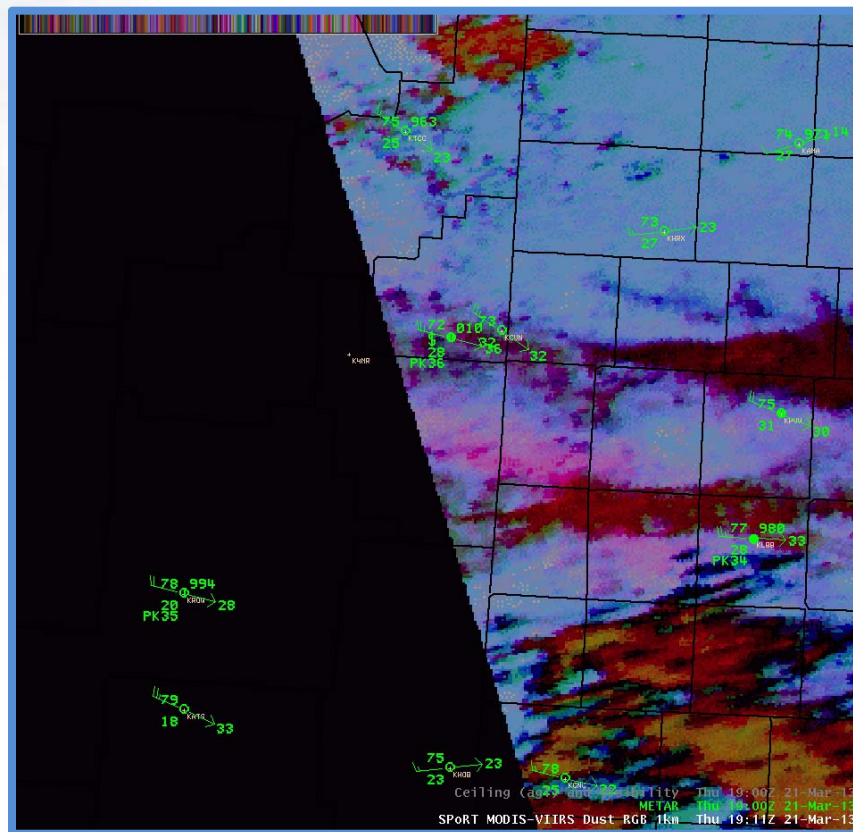


Visible imagery has mix of high and mid level clouds

Dust RGB shows plume under high clouds and provides extent

- Source region: 2011 burn scar

21-Mar-2013 MODIS/VIIRS Dust RGB



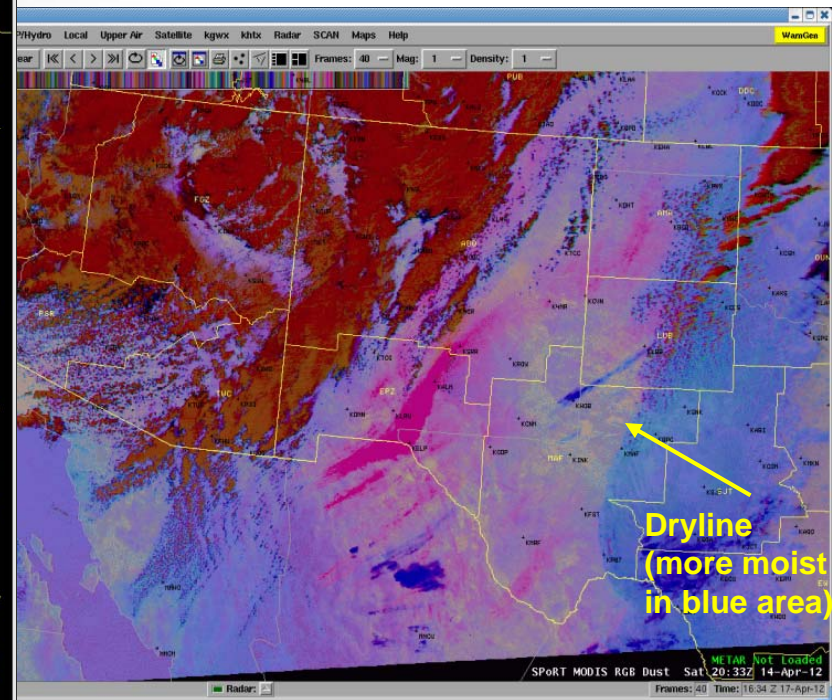
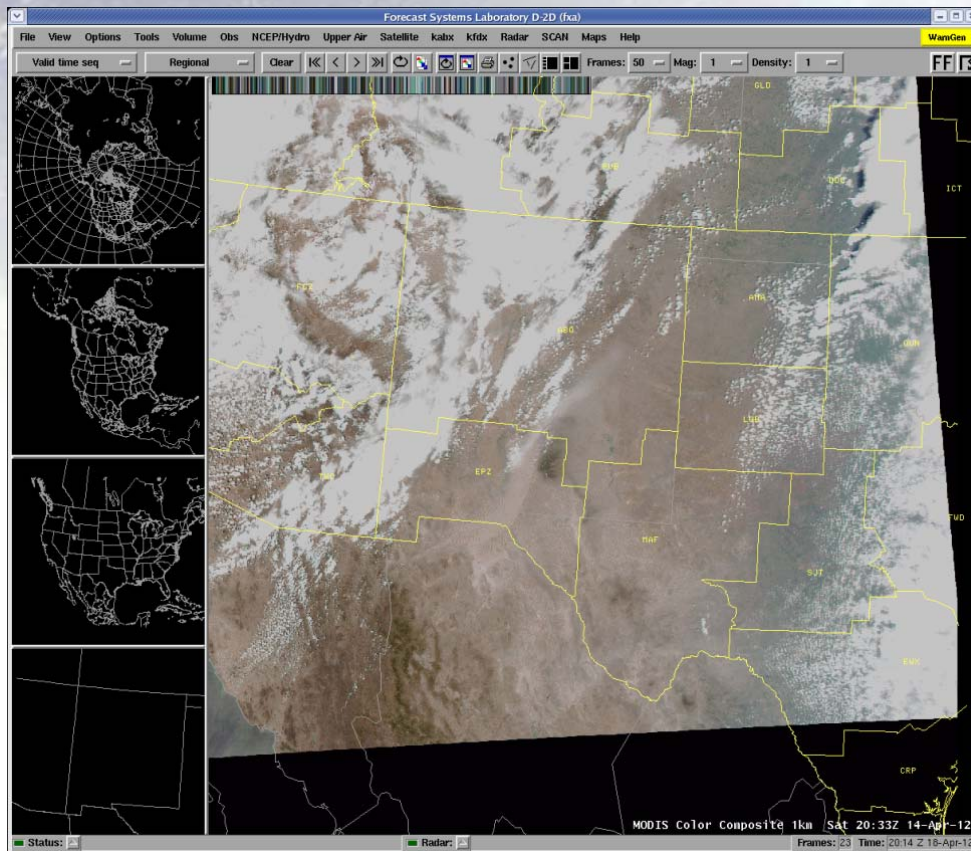
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# Daytime Example Dust vs True Color

Easier to see small plumes in Dust  
RGB in regions of dry/bare ground.

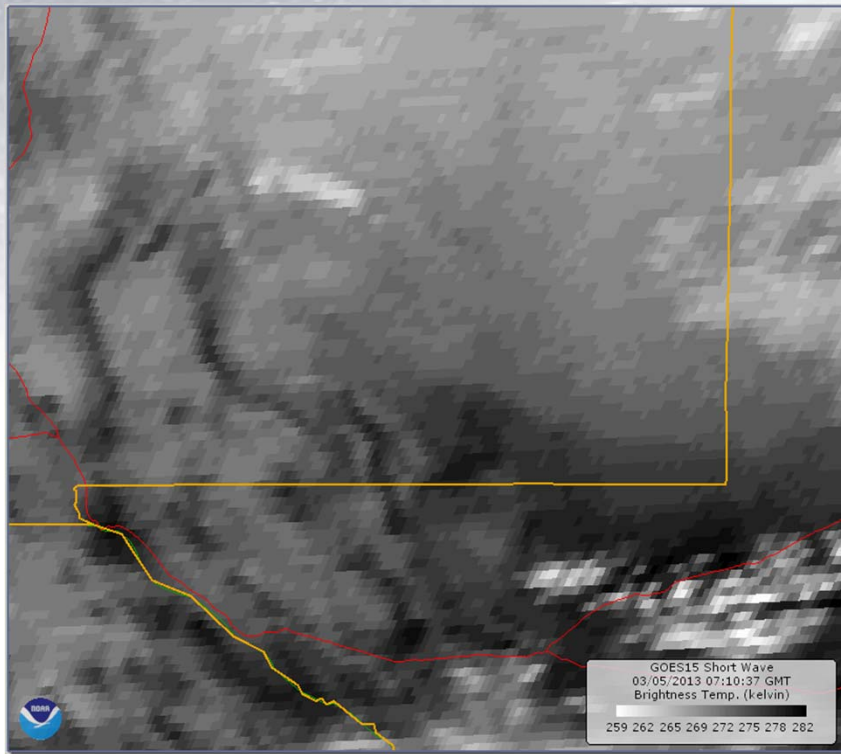


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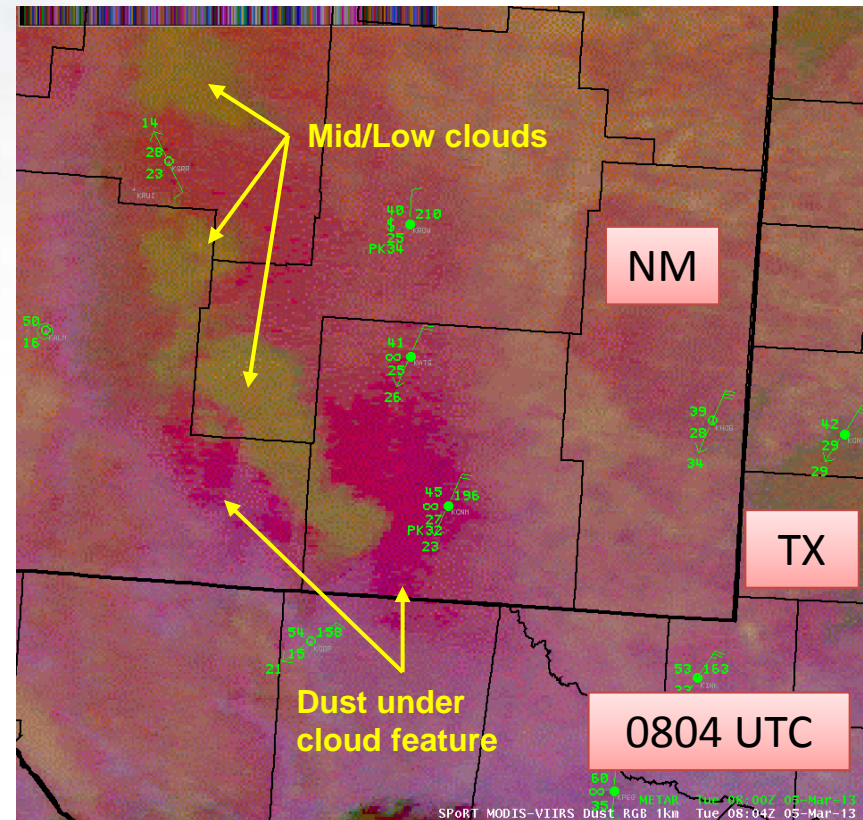


# Nighttime Example

05-Mar-2013 GOES 3.9 $\mu$ m 700-900 UTC



05-Mar-2013 MODIS/VIIRS Dust RGB



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# List of Recent Dust RGB Examples Documented by ABQ

August 2, 2013 Moisture Surge Western CONUS (other application)  
June 18, 2013 Moisture Surge Western NM (other application)  
May 21, 2013 Moisture Surge / Dry Line Southwestern TX  
May 19, 2013 Tucumcari Dust & Stability  
May 2, 2013 Poor Dust Overnight Case  
April 23, 2013 Cold Front, Dust & Low Clouds East Central NM  
April 16-17, 2013 Four Corners / Mexico NM Dust  
April 14-15, 2013 White Sands Dust  
April 8, 2013 Widespread Dust Dry Slot NMDOT Impact  
March 23, 2013 Major Dust Storm East Central NM (built file folder  
from Graphicast)  
March 21, 2013 Dust through Clouds East Central NM  
March 5, 2013 Cold Front Dust Southeastern NM  
November 10, 2012 Widespread Dust East GFE  
May 26, 2012 Four Corners Dust / WWB Smoke  
April 14, 2012 Dust Eastern Plains First Case?

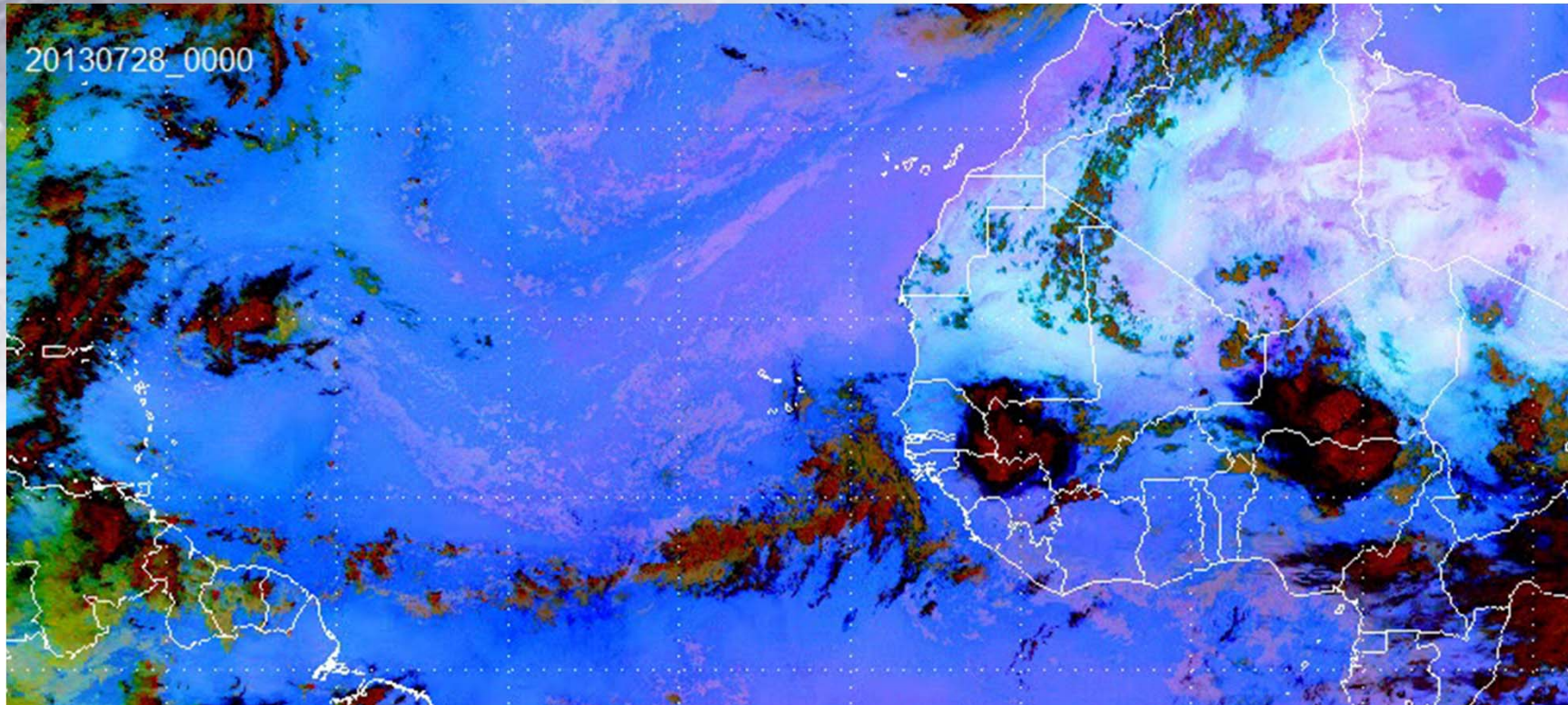


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# Future GOES Capability



([EUMETSAT Imagery Library](#))

- GOES-R/-S will have the channels needed to create the Dust RGB and many others
  - MODIS/VIIRS imagery can be used now and promote new skills in preparation for future GOES
- SPoRT providing MSG/ SEVIRI RGBs to NHC for Tropical Proving Ground



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# Future Work

- Publication in process with ABQ regarding operational integration
- Comparison of RGB to similar products and Dual Pol radar
- Use of Dust RGB for dryline analysis (color different in moist vs. dry regions)
- Other topics:
  - Use of RGB for Public Health warnings
  - Hazard notification to Dept of Transportation
  - Shapefile of dust source regions as background display



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# QUESTIONS?

Kevin Fuell : [kevin.fuell@uah.edu](mailto:kevin.fuell@uah.edu)  
Brian Guyer: [brian.guyer@noaa.gov](mailto:brian.guyer@noaa.gov)

<http://weather.msfc.nasa.gov/sport/>



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